

ent sizes and stages of development within the same plant. For adequate clarification of the significance of this variability it will be necessary to study the living tissues of stems and roots of plants growing in their native arid environments. From significant ecological, physiological, and biochemical points of view it is essential that this be done, particularly in adequate correlation with metabolic phenomena involved in the production of mucilage, of large amounts of organic acids and their calcium salts, and also in the accumulation and possible seasonal depletion of unusually abundant starch in the secondary xylem of large stems and roots.

It should be noted in conclusion that my collections from adult plants growing in their native habitats were preserved in FAA. The diverse forms of protein bodies in stems and roots have not dissolved after prolonged treatment in this fixative and subsequent mounting in diaphane for permanent slides. However, the possibility exists that changes in form may be induced by fixation in FAA. Molisch (1885) found that in the case of living cells of *Epiphyllum* the elongated and spindle forms of the bodies contracted longitudinally and expanded laterally prior to dissolving in acids and other reagents. The spindle-shaped bodies in living leaves of *Pereskopsis* behave similarly. Even in the least drastically modifying modern methods of fixation, the spindles may expand, or they may contract more or less laterally and at times even longitudinally. Transitions from anisotropic crystalline composition to isotropic amorphous form occur in some reagents.

The persistence of anisotropic filaments and elongated bodies in association with isotropic globular ones in the same section of a stem or root makes it appear unlikely that all of the amorphous globular and more massive forms are due to modifications of crystalline filamentous ones in FAA. I had hoped to test the possibility of such changes by obtaining living material from easily accessible greenhouses. Thus far none of the numerous stems from the unnatural environments of greenhouses contain protein bodies after fixation in FAA with exception of two collections from the Missouri Botanical Garden. Unless I can obtain living stems of such sporadically occurring specimens in greenhouses, it will be necessary to study the behavior of globular forms of bodies in living stems and roots of plants growing in their native habitats.

The presence of filamentous bodies in the vessels of one category of pereskias and their absence in the vessels of two other categories, and of *Pereskopsis* and *Quiabentia* provides some evidence of considerable taxonomic significance. However, the occurrence, distribution, and diversified forms of the protein bodies in haphazard collections of the second and third categories of pereskias are highly variable. Before utilizing conspicuous differences in the form and distribution of protein bodies as reliable diagnostic criteria in differentiating species, extensive collections of different plants must be obtained and studied in detail. Such an extensive investigation is hardly justifiable from a solely taxonomic point of view unless significant ecological, physiological, and biochemical data are obtained at the same time.

## ACKNOWLEDGMENTS

I am greatly indebted to Dr. Norman Boke for his continued kindness in sending me material of living plants growing in his greenhouse.

I am also indebted to Dr. Lalit Srivastava for his kind assistance in making slides of living leaves fixed in acrolein and stained in toluidine blue.

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## EXPLANATION OF PLATES

(All "protein bodies" stained with Millon's reagent or Haedenhein's iron-alum haematoxylin for photographic purposes.)

## PLATE I

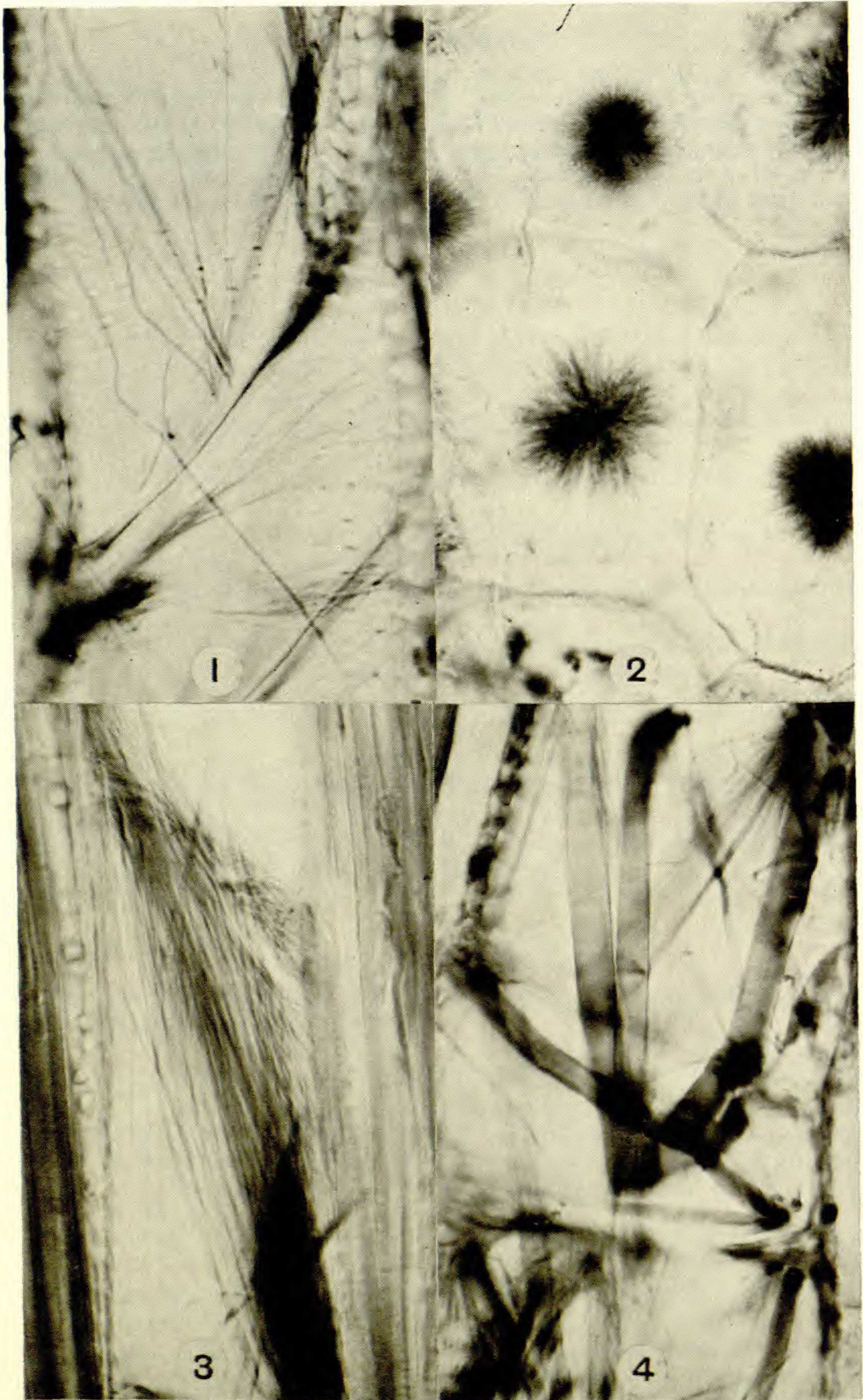
FIGS. 1-4. "Protein bodies" in *Pereskia*,  $\times 510$ . 1, Diffusely distributed tenuous filaments in vessel of *P. grandifolia*. 2, Stellate aggregations of tenuous filaments in unligified phloem parenchyma of *P. sacharosa*, stained in Millon's reagent. 3, Aggregated filaments in vessel of *P. tampicana*. 4, Coarse strands and tenuous filaments in vessel of *P. grandifolia*.

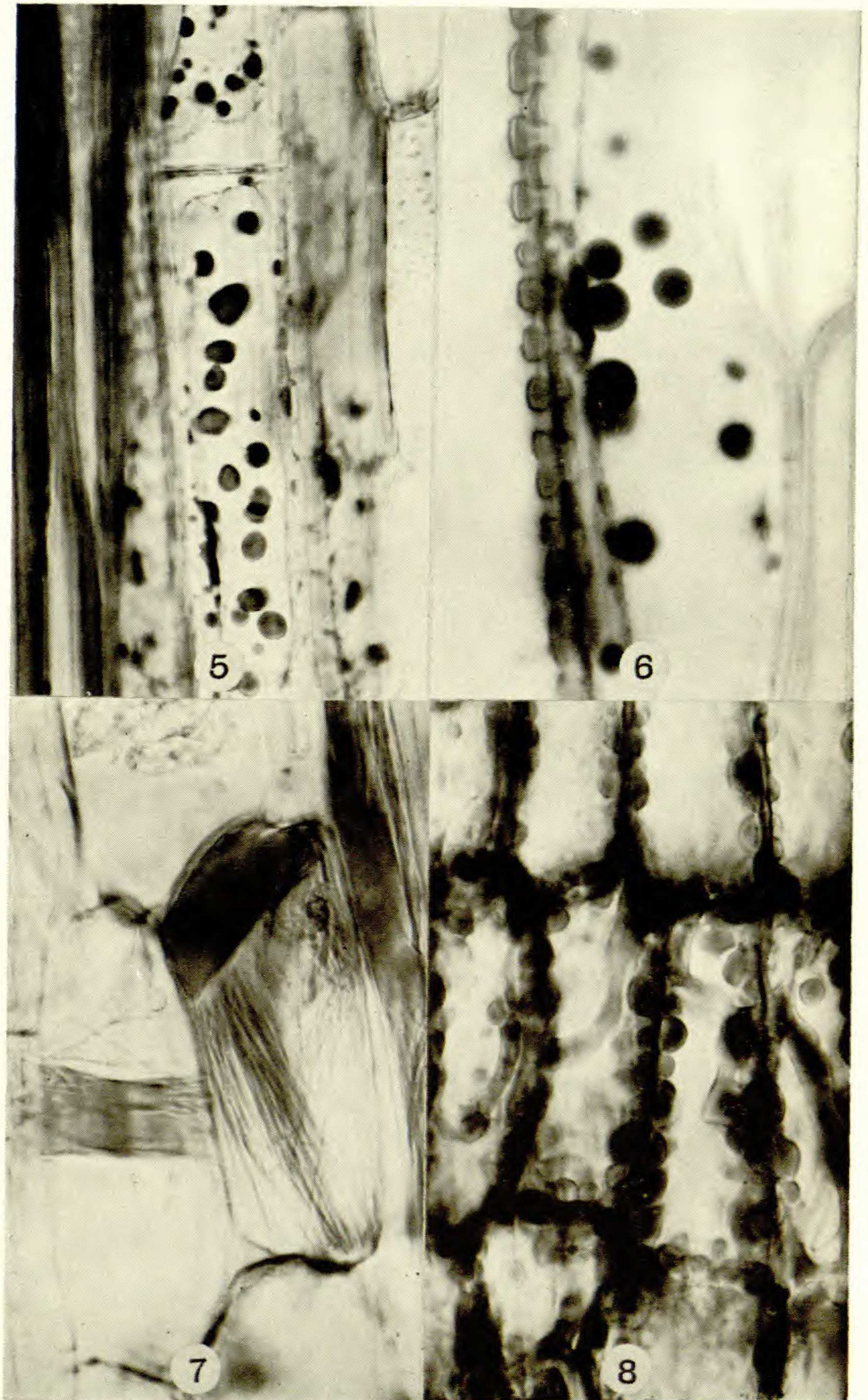
## PLATE II

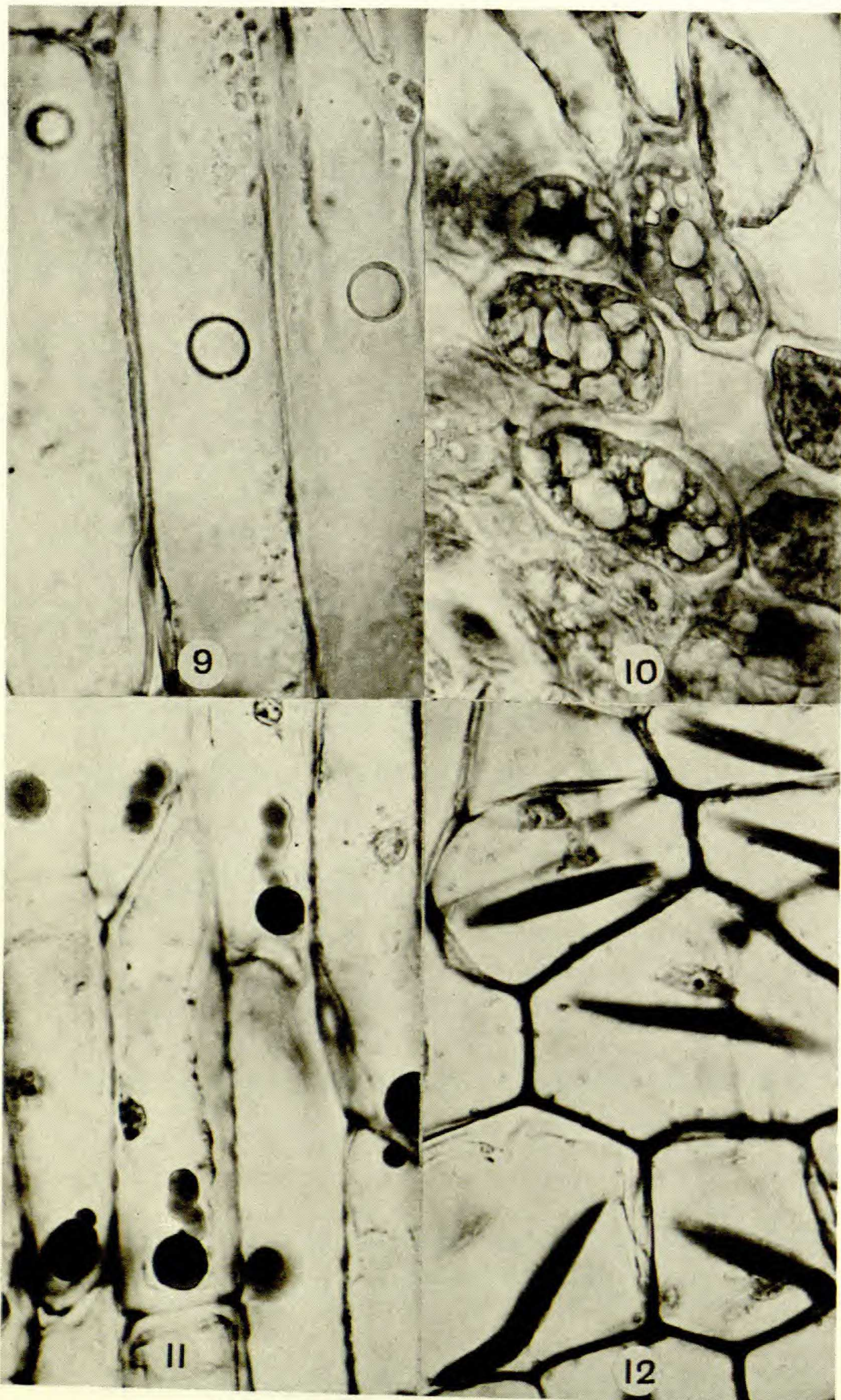
FIGS. 5-8. "Protein bodies" in *Pereskia*, FIGS. 5, 7, and 8  $\times 510$ , FIG. 6  $\times 1130$ . 5, Globular bodies in axially oriented wood parenchyma adjacent to vessel of *P. tampicana*. 6, Globular bodies in ray cell adjacent to vessel of *P. tampicana*. 7, Transitions from tenuous filaments to massive plates in phloem parenchyma of *P. tampicana*. 8, Spherical and hemispherical bodies in phloem parenchyma of *P. bleo*; bodies adhering to walls of cells with transitions to coarse convoluted strands.

## PLATE III

FIGS. 9-12. Diversified forms of "protein bodies"  $\times 510$ . 9, Large rings in outer cortex of *P. bleo* (compare Molisch *Fig. 2*). 10, Vacuolated or frothy appearing deposits in phloem ray cells of *P. guamacho*. 11, "Protein bodies" in axially oriented phloem parenchyma of *P. pititache*. 12, Spindle-shaped bodies in leaf of *Pereskopsis* [*Boke B-18*], nucleus with nucleolus near spindle in central cell of this figure stained in Haedenhein's iron-alum haematoxylin.







BAILEY, LEAF-BEARING CACTACEAE, XV

## THE DIRECTOR'S REPORT

THE ARNOLD ARBORETUM DURING THE FISCAL YEAR ENDED

JUNE 30, 1965

THE ARNOLD ARBORETUM WAS TWICE HONORED during the year: by the Massachusetts Horticultural Society and by the United States Department of the Interior. The Trustees of the Massachusetts Horticultural Society voted in November to award the large Gold Medal of the Society to the Arnold Arboretum for its horticultural leadership. The citation accompanying the medal notes that "new plants from the far corners of the world and new originations by its geneticists are combined with the rich collections of the past to enable the plant lover to watch their growth and evaluate their beauty. Its library, publications and herbarium are world renowned. Everyone who gardens owes it to himself to visit and benefit from this great horticultural center." Dr. Carroll E. Wood, Jr. accepted the medal for the Arboretum staff from Mr. Oliver Wolcott, President, during the annual meeting of the Society.

In January, the Secretary of the Interior, Stewart L. Udall, announced that the Arnold Arboretum was designated for recognition as a National Historic Landmark. The nominating citation read, "As well as being a beautiful park, the Arnold Arboretum is now America's pre-eminent institution for research in woody plants." The award was accepted jointly by Mayor John F. Collins, for the City of Boston, as owner of the land; by Commissioner William J. Devine, for the Department of Parks and Recreation, for its maintenance service of portions of the property; and by Mr. Nathan M. Pusey, for the President and Fellows of Harvard College, trustees of the Arboretum and responsible for its staff, collections, and research contributions. About 500 institutions or localities have been similarly honored throughout the country. Those responsible for the Arboretum agree to preserve so far as practicable and to the best of their ability, the historical integrity of this important part of the national heritage, "to continue to use the property only for the purposes consistent with its historical character." The Arboretum will be listed in official government publications of such sites but will not receive financial support, nor will there be any change in the joint operation of the Arboretum by the City of Boston and Harvard University. A bronze plaque will be placed on the Arboretum grounds during the next year.

**Staff:**

It is with deep regret that we report the deaths of Mrs. Susan Delano McKelvey on July 11, 1964, and of Mrs. Dorothy H. Marsh on April 13, 1965. Last year we reported Mrs. McKelvey's desire to retire from active

service on the Committee to Visit the Arnold Arboretum and as a Research Associate on the Arboretum staff. Her death such a very short time later was unexpected. In a biographical sketch and bibliography, published in the *Journal of the Arnold Arboretum* (46: 45-47. 1965), we have recorded her contributions as an outstanding horticulturist.

Mrs. Marsh worked part time as an artist on the project concerned with the Generic Flora of the Southeastern United States. Her illustrations of many of the critical genera of the area have been and will for some time to come be published in the continuing studies of the Flora which appear in the *Journal of the Arnold Arboretum*. The accuracy and high artistic quality of these drawings add immeasurably to the value of the published works.

The appointment of Dr. Lorin I. Nevling, Jr., as Associate Curator, without limit of time, was approved during the year. Dr. Nevling serves as Supervisor of the Herbarium of the Arnold Arboretum and Supervisor of the Herbarium of the Gray Herbarium on joint and simultaneous appointments.

Three new annual appointments were made during the year. Dr. Thomas Gordon Hartley, a graduate of the University of Iowa, has spent the past three years as botanist on a phytochemical survey of the native vegetation of Papua and New Guinea. His special familiarity with that vegetation will be of value in studies of our herbarium collections from the area. Dr. Ian Keith Ferguson, a graduate of Trinity College of the University of Dublin, was appointed to work with Dr. Wood on the Generic Flora of the Southeastern United States. Mr. Henry Barnes Hosmer was appointed an honorary Research Associate. The Arboretum will gain much from his interest in the introduction to this country of native plants of Afghanistan.

The appointment of Dr. Mary Elizabeth Sanders as a Research Fellow was renewed. Dr. Sanders holds the North Carolina-Sandeen Fellowship of the American Association of University Women.

Mr. Arnold David Clapman has been engaged as an artist to succeed Mrs. Marsh on the Flora project.

Mercer Research Fellowships for varying periods of time were awarded during the year to five scholars whose work would be aided by access to the collections of the Arnold Arboretum. Mr. Arturo Gómez Pompa, of the National University of Mexico and of its Botanical Garden, who came here as a Guggenheim Fellow, continued, as a Mercer Fellow, his work on the vegetation of Veracruz, Mexico. Dr. Hermanus Philippus van der Schijff, of the University of Pretoria, Republic of South Africa, who arrived in January, is working in the laboratory of wood anatomy on problems of stem enlargement. Dr. Hans U. Stauffer, of the University of Zurich, stopped briefly to examine materials of the Santalaceae. Dr. H.-Christian Friedrich, of the University of Munich, studied material of the Aizoaceae. M. Michel Colon, a recent graduate of the Royal School of Horticulture at Vilvorde, Belgium, spent several months taking part in various operational activities of the Arboretum to become familiar with